

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
15 July 2004 (15.07.2004)

PCT

(10) International Publication Number  
**WO 2004/059062 A1**

(51) International Patent Classification<sup>7</sup>: **D04H 13/00**,  
B32B 5/269, A61K 7/50, A47K 7/03, A61K 8/02

(21) International Application Number:  
PCT/EP2003/013638

(22) International Filing Date: 2 December 2003 (02.12.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
60/436,904 27 December 2002 (27.12.2002) US

(71) Applicant (for AE, AG, AU, BB, BW, BZ, CA, CY, EG, GB, GD, GH, GM, IE, IL, KE, LC, LK, LS, MN, MW, NZ, OM, PG, SC, SD, SG, SL, SZ, TT, TZ, UG, VC, ZA, ZM, ZW only): **UNILEVER PLC** [GB/GB]; Unilever House, Blackfriars, London EC4P 4BQ (GB).

(71) Applicant (for AL, AM, AT, AZ, BA, BE, BF, BG, BJ, BR, BY, CF, CG, CH, CI, CM, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, FR, GA, GE, GN, GQ, GR, GW, HR, HU, ID, IS, IT, JP, KG, KP, KR, KZ, LR, LT, LU, LV, MA, MC, MD, MG, MK, ML, MR, MX, MZ, NE, NI, NL, NO, PH, PL, PT, RO, RU, SE, SI, SK, SN, SY, TD, TG, TJ, TM, TN, TR, UA, UZ, VN, YU only): **UNILEVER NV** [NL/NL]; Weena 455, NL-3013 AL Rotterdam (NL).

(71) Applicant (for IN only): **HINDUSTAN LEVER LIMITED** [IN/IN]; Hindustan Lever House, 165/166 Backbay Reclamation, Maharashtra, 400 020 Mumbai (IN).

(72) Inventors: **BERGQUIST, Paul, Roland**; Unilever Home & Personal Care USA, 40 Merritt Boulevard, Trumbull, CT 06611 (US). **LAGATOL, Shauna, Mary**; Unilever Home & Personal Care USA, 40 Merritt Boulevard, Trumbull, CT 06611 (US). **URBAEZ, Jesus, Antonio**; Unilever Home & Personal Care USA, 40 Merritt Boulevard, Trumbull, CT 06611 (US). **WILLIAMS, David, Robert**; Unilever Home & Personal Care USA, 40 Merritt Boulevard, Trumbull, CT 06611 (US). **GRISSELT, Gregory, Aaron**; Unilever Home & Personal Care USA, 40 Merritt Boulevard, Trumbull, CT 06611 (US). **MACEDO, Filomena, Augusta**; Unilever Home & Personal Care USA, 40 Merritt Boulevard, Trumbull, CT 06611 (US).

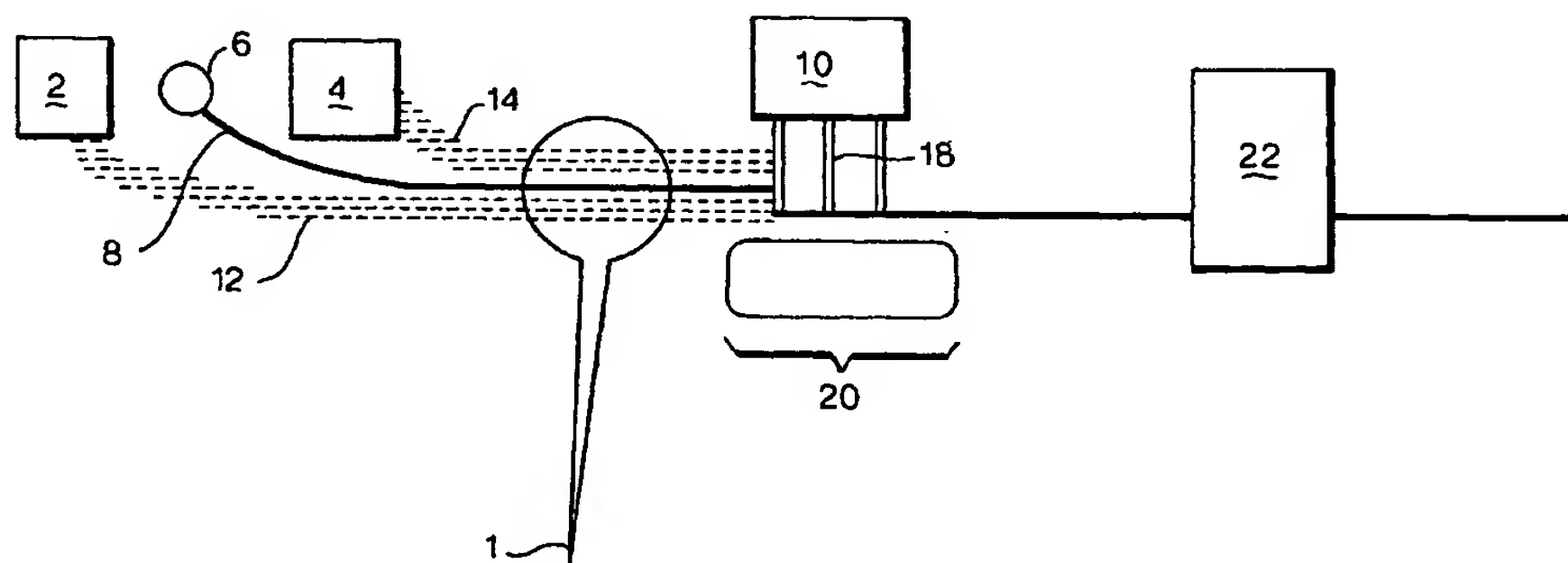
(74) Agent: **MULDER, Cornelis, Willem, Reinier**; Unilever PLC, Patent Department, Colworth House, Sharnbrook, Bedford, Bedfordshire MK44 1LQ (GB).

(81) Designated States (national): AE, AG, AL, AM, AT (utility model), AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ (utility model), CZ, DE (utility model), DE, DK (utility model), DK, DM, DZ, EC, EE (utility model), EE, EG, ES, FI (utility model), FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT (utility model), PT, RO, RU, SC, SD, SE, SG, SK (utility model), SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (regional): ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),

[Continued on next page]

(54) Title: HYDROENTANGLED TEXTILE AND USE IN A PERSONAL CLEANSING IMPLEMENT



(57) Abstract: A non-woven hydroentangled textile is described formed in cross-section with a central area of low mass fiber density surrounded on both sides by areas of higher mass density. Further, a personal cleansing article is described wherein the hydroentangled textile is associated with a personal cleansing composition that includes a lathering surfactant. The composition is deposited onto, impregnated into or at least is partially enclosed by the textile. Also described is a process for producing the textile involving feeding into a hydroentangling unit a loose random assembly of fibers both above and below a fibrous screen modifying textile substrate.

**BEST AVAILABLE COPY**



Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),  
European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE,  
ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE,  
SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA,  
GN, GQ, GW, ML, MR, NE, SN, TD, TG).

**Published:**

— with international search report

— before the expiration of the time limit for amending the  
claims and to be republished in the event of receipt of  
amendments

*For two-letter codes and other abbreviations, refer to the "Guid-  
ance Notes on Codes and Abbreviations" appearing at the begin-  
ning of each regular issue of the PCT Gazette.*

HYDROENTANGLED TEXTILE AND USE  
IN A PERSONAL CLEANSING IMPLEMENT

The invention concerns a new non-woven textile, and use of  
5 this textile in a personal cleansing implement.

Hydroentanglement is a process utilized to form non-woven  
fabrics. The conventional process involves delivery of a  
loose, random assembly of relatively open fibers to a  
hydroentanglement unit via a series of fiber card machines.  
10 The loose, random assembly of fibers is conveyed through a  
series of high-velocity water jets aimed at curling and  
entangling the loose assembly of fibers about each other.  
Entanglement therefore provides strength and dimensional  
stability.

15 The primary method of structure development to achieve a  
surface texture occurs on a forming belt or screen onto  
which the loose fibers are deposited. These forming belts  
or screens are constructed of woven metal or plastic wires,  
usually in plain weave configuration. For screens with  
20 large diameter wires, an open screen structure is created.  
Water jet forces onto the open screen structures at the wire  
intersections or knuckles move fiber away creating an  
opening or aperture in the subsequent non-woven structure.  
Open areas within the screen permit fiber entangling to  
25 occur. Hydroentanglement can either consolidate a fibrous  
web to impart strength, modify surface texture or act as  
both a web consolidation and surface texturing mechanism.

- 2 -

Certain types of personal care products require use of a non-woven substrate. These are applied to the skin delivering a lathering surfactant. In this context, there has been a need for a non-woven substrate with areas of low-  
5 mass fiber density surrounded by areas of greater-mass fiber density. In particular, a non-woven structure was sought based on a bonded fibrous assembly with improved coverage and loft.

In a first aspect, a non-woven hydroentangled textile is  
10 provided formed in cross-section with a central area of low mass fiber density surrounded above and below (i.e. sandwiched) by areas of higher mass fiber density.

Furthermore, there is provided a personal care cleansing product formed from:

- 15 (i) a non-woven hydroentangled textile formed in cross-section with a central area of low mass fiber density surrounded above and below by areas of higher mass fiber density; and
- (ii) a personal cleansing composition comprising  
20 lathering surfactant deposited onto, impregnated into or at least being partially enclosed by the textile.

Still further, there is provided a process for the manufacture of a non-woven hydroentangled textile which  
25 includes:

- (i) feeding a fibrous screen modifying textile substrate into a hydroentangling unit;

- 3 -

- (ii) feeding a loose random assembly of fibers into the hydroentangling unit, a portion of the assembly of fibers being deposited over and another portion of the assembly of fibers being deposited under the screen modifying textile substrate thereby forming a layered fibrous assembly;
- (iii) applying a high velocity water jet to the layered fibrous assembly within the hydroentangling unit; and
- (iv) transporting a resultant hydroentangled layered fibrous assembly to a drying area.

Further features and advantages of the present invention will become more apparent from consideration of the drawing, in which Figure 1 is the sole figure illustrating the process according to the present invention.

Now there has been developed a non-woven hydroentangled water-insoluble fabric which is a bonded fibrous assembly with improved coverage and loft. This textile has in cross-section an area of low mass fiber density (apertured), surrounded by areas of greater mass fiber density on either side. This modified hydroentangled arrangement is achieved by incorporating a screen modifying substrate in the normal hydroentangling process. In this system an apertured screen is utilized to obtain a non-apertured non-woven.

Conventional web formation techniques utilize a series of card machines to present a random loose fibrous assembly to the high velocity water jets. A screen modifying substrate labeled by some as a "scrim" according to the present

- 4 -

invention is incorporated between two card machines. This results in a layered fibrous assembly comprised of both staple and continuous filament fibers. The presence of the fiber screen modifying substrate allows a certain amount of staple fibers to be entangled with a screen modifying substrate over the forming wire intersections (knuckles). This reduces the aperture forming capabilities of the forming belt or screen. Some embodiments may utilize four or more card machines and may even have more than one scrim.

10 The fibrous screen modifying substrate can be one comprised of randomly laid bonded continuous fibers. These fibers may be formed of polyethylene terephthalate (PET), polypropylene (PP), polyamide (PA), polyethylene (PE) and fiber combinations thereof. The fiber denier may range from about 0.1 to about 15, preferably from about 1 to about 7 denier. Substrate basis weight may range from about 5 to about 50 g/m<sup>2</sup>, preferably from about 10 to about 25 g/m<sup>2</sup>, optimally from about 12 to about 18 g/m<sup>2</sup>.

A larger mass density above the screen modifying substrate improves product texture. The resultant non-woven structure is thereby comprised of areas of low-mass fiber density surrounded by areas of greater-mass fiber density. Larger mass density below the screen modifying substrate allows greater control in terms of aperture. The basis weight of loose, random assembly of fibers used above the screen modifying substrate may range from about 5 to about 100 g/m<sup>2</sup>, preferably from about 20 to about 60 g/m<sup>2</sup>, optimally from

- 5 -

- about 35 to about 45 g/m<sup>2</sup>. Similarly, the basis weight of loose, random assembly of fibers used below the screen modifying substrate may range from about 5 to about 100 g/m<sup>2</sup>, preferably from about 20 to about 60 g/m<sup>2</sup>, optimally from about 35 to about 45 g/m<sup>2</sup>. Advantageously the total amount of the basis weight of fiber deposited above and below the central area (screen modifying substrate) may range from about 20 to about 150 g/m<sup>2</sup>, more preferably from about 30 to about 100 g/m<sup>2</sup>, and optimally from about 40 to about 85 g/m<sup>2</sup>.
- 10 In a preferred embodiment, the basis weight above and below the screen modifying substrate may range respectively in a ratio from about 3:1 to about 1:3, preferably about 2:1 to about 1:2, but optimally is substantially identical in a ratio of about 1:1.
- 15 Advantageously the amount of total basis weight (above and below the central area) to that of the screen modifying substrate may range from about 10:1 to about 1:2, preferably from about 6:1 to about 1:1, optimally from about 4:1 to about 2:1.
- 20 The hydroentangled textiles of the present invention may include a textured pattern, especially on an outer surface which has been in direct contact with the forming belt (screen). Peak to valley ratios may vary widely. Variation can be a function of the amount of loose random fibers
- 25 deposited onto the scrim. Other factors include the degree of entanglement energy (water jet pressure against loose



- 6 -

random fiber assembly applied prior to the hydroentangling unit) and the aperturing energy (water jet pressure within the hydroentangling unit). Still further, topography can be dependent upon the size of aperture openings within the forming belt (screen).

Forming belts or screens utilized during hydroentangling can be constructed of woven metal or plastic wires usually in plain weave configuration. Forming belts with open screen structures are incorporated during product manufacture. The degree of screen structure openings can be varied to modify product texture and form. Smaller screen structures (or openings) will decrease the variable mass fiber density obtained in product structures.

Water jet pressures during the hydroentanglement may range from about 50 to about 5,000 psi, preferably from about 200 to about 3,000 psi, optimally from about 1000 to about 2,000 psi.

Figure 1 illustrates the process for producing the non-woven textile according to the present invention. Card machines 2, 4 serve as a storage and dispensing reservoir of loose, random fibers (e.g. polypropylene). A delivery role 6 feeds a non-woven spunlaced web 8 serving as the fibrous screen modifying substrate. This substrate is fed into a hydroentangling unit 10. Simultaneously a stream of loose random fibers 12, 14 are delivered from respective card machines 2, 4 above and below substrate 8. Together the combination entering the hydroentangling unit 10 is a layered fibrous assembly 16.



- 7 -

Prior to entering the hydroentangling unit 10, optionally there may be a pre-entangling step wherein water jet pressure is applied to the layered fibrous assembly 16 in order to add strength thereto. Within the hydroentangling unit, the layered fibrous assembly 16 is subjected to a high velocity water spray from jets 18 as the layered fibrous assembly 16 is supported on a forming belt (screen) 20. The forming belt 20 then transports the hydroentangled layered fibrous assembly to a drying unit 22. Therein water is removed, and the resultant hydroentangled textile is completed.

The non-woven textile of the present invention although constructed of a fibrous screen modifying substrate 8 and sandwiched between a random assembly of fibers 12, 14 is considered to be a single layered substrate. The reason is that subsequent to hydroentanglement, the textile cannot be separated into its component parts (i.e. substrate 8 and fibers 12, 14) without destruction of the textile. The basis weight for the textile of this invention may range from about 15 to about 200 g/m<sup>2</sup>, preferably from about 60 to about 150 g/m<sup>2</sup>, and optimally from about 80 to about 110 g/m<sup>2</sup>.

For purposes of this invention, the fibrous screen modifying substrate 8 may be either a spunlace or a carded/chemically bonded spunbond non-woven water-insoluble material. Sources for the substrate 8 can be spunbonded scrim available from Reemay Corporation of Tennessee, Superior Nonwovens of South Carolina, and PGI Corporation of South Carolina. The loft

- 8 -

of textiles according to the present invention may range from a density of from about 0.00005 to about 0.1 g/cm<sup>3</sup>, preferably from about 0.001 to about 0.09 g/cm<sup>3</sup> and a thickness from about 0.1 to about 5 cm.

5 As used herein, "non-woven" means that the layer does not comprise fibers which are woven into a fabric, but the layer need not comprise fibers at all, e.g. formed films, sponges, foams or scrims. When the layer comprises fiber, the fibers can either be random (i.e. randomly aligned) or they can be  
10 carded (combed to be oriented in primarily one direction).

Textiles of the present invention may be utilized as implements in personal care cleansing products which may be appropriate for single use purposes. In these products, the textile may be impregnated or coated with a lathering  
15 surfactant and optionally skin conditioners. Representative of this technology are disclosures found in U.S. Patent 6,280,757 (McAtee et al.), U.S. Patent 5,980,931 (Fowler et al.), WO 00/42961 (Smith) and WO 01/08542 (Cen et al.), all herein incorporated by reference.

20 Alternatively, the textile can be incorporated into a sachet with at least one wall of the sachet formed from a textile of the present invention, and optionally other walls of the sachet formed from a variety of other water-insoluble woven or non-woven fabrics. A lathering surfactant and optionally  
25 conditioners may in dry particulate form be enclosed within the sachet. These products are exemplified and described in U.S. Patent 6,063,390 (Farrell et al.) herein incorporated by reference.

- 9 -

An advantage of textiles according to the present invention in the context of personal cleansing sachets or pillows as described in U.S. Patent 6,063,390 is that powdered surfactant and other powdered ingredients are prevented  
5 during dry storage from escaping through apertures in the textile. These apertures are sufficiently small to retain powder, but sufficiently large to allow water to penetrate the sachet to activate surfactant and other ingredients (such as effervescent compounds) in the personal cleansing  
10 wash process. Additionally, the textile of the present invention on its outer surface exhibits a looser high loft structure with advantages for enhancing lathering of the surfactant and a softer feel when rubbed on the skin.

- 15 A preferred embodiment of a personal cleansing article using the textile of the present invention is one which includes:
- (i) an effervescent cleansing composition capable of generating foam upon contact with water; and
  - (ii) a pouch formed of first and second water-insoluble  
20 substrates, at least one being water permeable, the first and second water-insoluble substrates forming therebetween an area housing the cleansing composition, and at least one of the substrates being a textile of construction according to the  
25 present invention.

Effervescent cleansing compositions which may be deposited into the pouch of the pillow typically include a first component which is an acidic material, and a second component which is an alkaline material. The acidic  
30 material is preferably citric acid, and the alkaline

- 10 -

material is preferably a bicarbonate such as sodium bicarbonate. Amounts of the acid and alkaline materials may each range from about 1 % to about 80 %, preferably from about 15 % to about 40 % by weight of the total composition  
5 within the sachet.

A wide variety of lathering surfactants may be used with the textile of this invention in any of its personal cleansing embodiments. Useful lathering surfactants include sodium lauryl sulfate, sodium lauryl ether sulfate, sodium lauroyl  
10 sarcosinate, sodium cocoyl taurate, sodium cocoyl isethionate, sodium alkyl amido propyl betaine, sodium C<sub>14</sub>-C<sub>16</sub> olefin sulfonate, sodium lauryl sulfoacetate and any combinations thereof. The lathering surfactants may be of the anionic, cationic, nonionic, amphoteric, zwitterionic varieties and any  
15 combinations thereof. Amounts of the surfactant may range from about 0.1 % to about 30 %, preferably from about 1 % to about 25 %, optimally from about 8 % to about 20 % by weight of the total composition placed onto or in combination with the textile in personal cleansing products.

20 Conditioners, whether water-soluble or water insoluble or combinations thereof, may be included in the composition used with the textile implement according to the present invention. Suitable conditioners may include natural or synthetic esters, silicone oils, hydrocarbons, starches,  
25 fatty acids, cationic polymers and mixtures thereof. Typically the conditioners may range in amount from about 0.1 % to about 35 % by weight of the total composition.

- 11 -

Examples

Except in the operating and comparative examples, or where otherwise explicitly indicated, all numbers in this description indicating amounts of material ought to be  
5 understood as modified by the word "about".

The term "comprising" is meant not to be limiting to any subsequently stated elements but rather to encompass non-specified elements of major or minor functional importance. In other words the listed steps, elements or options need  
10 not be exhaustive. Whenever the words "including" or "having" are used, these terms are meant to be equivalent to "comprising" as defined above.

Example 1

Personal cleansing pillows were constructed similar to those  
15 described in WO 03/022230, the entire content of which is specifically herein incorporated by reference. A powder similar to that described under Table II of the aforementioned patent application was placed as a powdered substance within the pouch of the pillows. A water-  
20 permeable wall of the aforementioned pillow was constructed with a non-woven hydroentangled textile according to the present invention. This example correlates the Air Permeability of hydroentangled textiles with different weight ratios of fiber for high (total above and below) to  
25 low mass fiber density areas, and to evaluate Lather Release. For these experiments, the amounts of high mass

- 12 -

density fiber was about equivalent in the areas above and below the low mass density fiber of the central area.

Sample	Weight Ratio (high/low)	Total Weight (g/m <sup>2</sup> )	Air Permeability*
I	3	82	266
II	2.5	71.5	477
III	1.5	51	678
IV	4	102	371
V	4.1667	103	348
VI	2.875	102	250
VII	3.375	61	529

\* Measured according to ASTM D737-96.

5 Lather Release was measured in the following manner.

A thermometer was attached to a sink faucet to read water temperature. The temperature of the water was then adjusted to 100°F (38°C) and maintained at that temperature. A sample pillow was taken in hand, and placed in a stream of  
 10 water for 3 seconds. The pillow was rotated in the hands so that both sides of the pillow would be exposed. Again the pillow was held in the water stream for another 3 seconds. As the pillow left the water stream, a timer was set to measure length of time required for full lather release.  
 15 These times were noted and visual observations recorded. "Lather Release" was rated on the following scale:

Very good = 0.2 seconds and represents full Lather Release instantaneously on both sides of the pillow; moderate billowing pressure should be noted;

- 13 -

Good = 1-2 second with full Lather Release on both sides of the pillow;

5 Fair = 2-4 seconds with slower Lather Release and different release rates seen from one side to another;

Poor = 3-6 seconds with slow Lather Release, and high billowing internal pillow pressure.

10 The above procedure for each sample was repeated for 3-5 pillows of the same type. A combination of time and consensus from an expert panel based on the above procedure was utilized to provide the Lather Release description in the Table below.

Sample	Air Permeability	Lather Release
I	266	Poor
II	477	Good
III	678	Very Good
IV	371	Fair
V	348	Fair
VI	250	Poor
VII	529	Very Good

15 Best Performance was achieved with Samples III and VII. These correlated with the highest level of Air Permeability. Consequently, the non-woven textile of the present invention should have a structure with an Air Permeability above 250, preferably at least 300 and optimally at least 500. The preferred range is from about 300 to about 1,000. It is to  
20 be noted that if the system becomes too Air Permeable, a



- 14 -

powder held within the pillow would undesirably escape prior to being activated with water.

- 15 -

CLAIMS

1. A non-woven hydroentangled textile formed in cross-section with a central area of low mass fiber density surrounded on both sides by areas of higher mass fiber density.  
5
2. The textile according to claim 1 which cannot be separated into multiple layers after formation without destruction of the textile.
- 10 3. The textile according to claim 1 or claim 2 wherein the areas of higher mass fiber density on both sides relative to the central area of low mass fiber density have a basis weight ratio ranging from 10:1 to 1:2.
- 15 4. The textile according to claim 3 wherein the ratio ranges from 6:1 to 1:1.
5. The textile according to any of the preceding claims wherein the Air Permeability ranges from 300 to 1,000.
- 20 6. A process for the manufacture of a non-woven hydroentangled textile comprising:
  - (i) feeding a fibrous screen modifying textile substrate into a hydroentangling unit;
  - 25 (ii) feeding a loose random assembly of fibers into the hydroentangling unit, a portion of the assembly of fibers being deposited over and another portion of the assembly of fibers being deposited under the

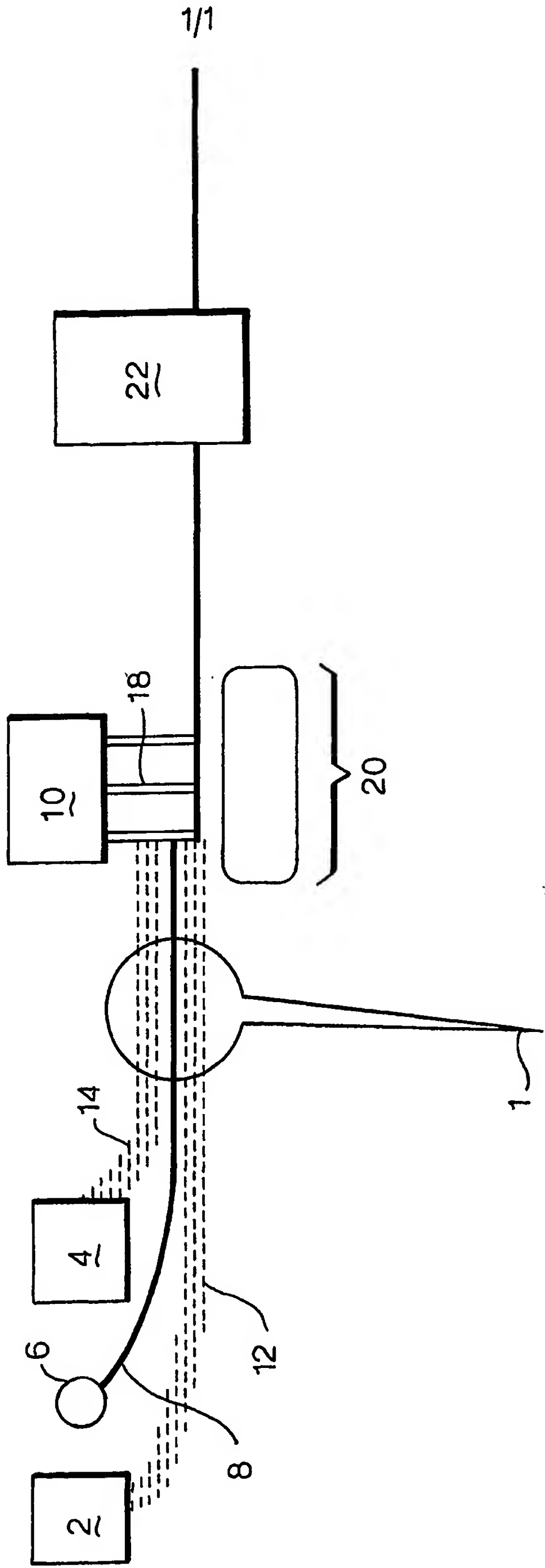
- 16 -

- screen modifying textile substrate thereby forming  
a layered fibrous assembly;
- (iii) applying a high velocity water jet to the layered  
fibrous assembly within the hydroentangling unit;
- 5 and
- (iv) transporting a resultant hydroentangled layered  
fibrous assembly to a drying area.
7. A personal cleansing article comprising:
- a) a non-woven hydroentangled textile formed in cross-  
10 section with a central area of low mass fiber  
density surrounded on both sides by areas of higher  
mass fiber density; and
- (b) a personal cleansing composition comprising a  
lathering surfactant deposited onto, impregnated  
15 into or at least being partially enclosed by the  
textile.
8. The article according to claim 7 wherein the lathering  
surfactant is present in amount from 0.1 to 30% by weight  
of the composition.
- 20 9. The article according to claim 7 or claim 8 wherein the  
personal cleansing composition further comprises from 0.1  
% to 35% by weight of a water-soluble or water-insoluble  
skin conditioning agent.
- 25 10. The article according to any of claims 7 to 9 wherein the  
personal cleansing composition further comprises  
effervescent ingredients capable of generating a foam  
upon contact with water.

- 17 -

11. The article according to any of claims 7 to 10 wherein the effervescent ingredients comprise an acid and a bicarbonate salt.
- 5 12. The article according to any of claims 7 to 11 wherein the areas of higher mass fiber density on both sides relative to the central area of low mass fiber density have a basis weight ratio ranging from 10:1 to 1:2.

Fig.1.



# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/EP 03/13638

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 D04H13/00 B32B5/26 A61K7/50 A47K7/03 A61K8/02

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 D04H B32B A61K A47K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 308 320 A (JAMES RIVER CORP) 22 March 1989 (1989-03-22) example 4	1-4
X	EP 0 534 863 A (FIBERWEB NORTH AMERICA INC) 31 March 1993 (1993-03-31) column 6, line 3 - column 8, line 48; figure 1	6
X	WO 00/77286 A (NOELLE FREDERIC ; RIETER PERFOJET (FR); VUILLAUME ANDRE (FR)) 21 December 2000 (2000-12-21) figure 1; example 1	6
X	US 5 334 446 A (QUANTRILLE THOMAS E ET AL) 2 August 1994 (1994-08-02) figures	6
	-/--	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

### \* Special categories of cited documents :

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

- \*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- \*Z\* document member of the same patent family

Date of the actual completion of the international search

6 May 2004

Date of mailing of the international search report

04/06/2004

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax (+31-70) 340-3016

Authorized officer

Barathe, R

# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/EP 03/13638

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6 063 390 A (FARRELL LINDA ET AL) 16 May 2000 (2000-05-16) cited in the application the whole document	7-12
A	WO 00/18996 A (KIMBERLY CLARK CO) 6 April 2000 (2000-04-06) the whole document	1-6
A	EP 0 418 493 A (FIBERWEB NORTH AMERICA INC) 27 March 1991 (1991-03-27) the whole document	1-6
A	EP 1 126 066 A (VALEO) 22 August 2001 (2001-08-22) the whole document	1,6
P,A	WO 03/022230 A (UNILEVER PLC ; LEVER HINDUSTAN LTD (IN); UNILEVER NV (NL)) 20 March 2003 (2003-03-20) cited in the application the whole document	1-12
A	US 6 280 757 B1 (HASENOEHRL ERIK J ET AL) 28 August 2001 (2001-08-28) cited in the application column 7, line 1 - line 60	1-12
A	WO 01/08542 A (PROCTER & GAMBLE) 8 February 2001 (2001-02-08) page 4, lines 3-10	1-12



# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP 03/13638

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 0308320	A	22-03-1989	US 4808467 A	28-02-1989
			AT 97454 T	15-12-1993
			CA 1312493 C	12-01-1993
			DE 3885691 D1	23-12-1993
			DE 3885691 T2	09-06-1994
			DK 510988 A	15-03-1989
			EP 0308320 A2	22-03-1989
			FI 884231 A	16-03-1989
			JP 1111056 A	27-04-1989
			NO 884088 A ,B,	16-03-1989
			PT 88511 A ,B	31-07-1989
EP 0534863	A	31-03-1993	AU 2600292 A	01-04-1993
			BR 9203820 A	20-04-1993
			CA 2079246 A1	31-03-1993
			EP 0534863 A1	31-03-1993
			JP 6294060 A	21-10-1994
			MX 9205621 A1	01-05-1993
			US 5324580 A	28-06-1994
WO 0077286	A	21-12-2000	FR 2794776 A1	15-12-2000
			AU 4932000 A	02-01-2001
			CN 1355864 T	26-06-2002
			EP 1192306 A1	03-04-2002
			WO 0077286 A1	21-12-2000
			JP 2003502515 T	21-01-2003
			PL 352192 A1	11-08-2003
			TR 200103471 T2	22-07-2002
			US 2002157766 A1	31-10-2002
US 5334446	A	02-08-1994	AU 3482093 A	01-09-1993
			AU 3589193 A	01-09-1993
			BR 9305793 A	18-02-1997
			CA 2128731 A1	05-08-1993
			CA 2128732 A1	05-08-1993
			EP 0621910 A1	02-11-1994
			EP 0621911 A1	02-11-1994
			JP 7503291 T	06-04-1995
			JP 7503292 T	06-04-1995
			MX 9300386 A1	01-08-1993
			WO 9315247 A1	05-08-1993
			WO 9315248 A1	05-08-1993
			WO 9503443 A1	02-02-1995
			US 5393599 A	28-02-1995
			US 5431991 A	11-07-1995
US 6063390	A	16-05-2000	AT 224700 T	15-10-2002
			AU 738364 B2	13-09-2001
			AU 4911299 A	28-02-2000
			BR 9912769 A	08-05-2001
			CA 2337716 A1	17-02-2000
			CN 1311664 T	05-09-2001
			CZ 20010489 A3	15-08-2001
			DE 69903175 D1	31-10-2002
			DE 69903175 T2	22-05-2003
			WO 0007561 A1	17-02-2000
			EP 1230915 A2	14-08-2002
			EP 1102577 A1	30-05-2001

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP 03/13638

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 6063390	A		ES 2184476 T3 HU 0103200 A2 ID 27555 A IN 188748 A1 JP 2002522369 T PL 345891 A1 RU 2220709 C2 US 6217854 B1 US 2001026792 A1 US 2002039558 A1	01-04-2003 28-02-2002 12-04-2001 02-11-2002 23-07-2002 14-01-2002 10-01-2004 17-04-2001 04-10-2001 04-04-2002
WO 0018996	A	06-04-2000	US 6177370 B1 AU 760428 B2 AU 6253199 A CA 2344831 A1 EG 22044 A EP 1131480 A1 JP 2002525450 T WO 0018996 A1 US 6550115 B1	23-01-2001 15-05-2003 17-04-2000 06-04-2000 30-06-2002 12-09-2001 13-08-2002 06-04-2000 22-04-2003
EP 0418493	A	27-03-1991	EP 0418493 A1 JP 3137257 A US 5369858 A	27-03-1991 11-06-1991 06-12-1994
EP 1126066	A	22-08-2001	FR 2804697 A1 EP 1126066 A1	10-08-2001 22-08-2001
WO 03022230	A	20-03-2003	WO 03022230 A1 US 2003064042 A1	20-03-2003 03-04-2003
US 6280757	B1	28-08-2001	US 6153208 A US 6190678 B1 US 6132746 A US 2003113364 A1 US 2002009484 A1 US 6338855 B1 AU 740839 B2 AU 7227398 A CA 2290352 A1 CN 1261788 T EP 0983057 A1 WO 9852537 A1 JP 2001517240 T ZA 9804256 A	28-11-2000 20-02-2001 17-10-2000 19-06-2003 24-01-2002 15-01-2002 15-11-2001 11-12-1998 26-11-1998 02-08-2000 08-03-2000 26-11-1998 02-10-2001 25-11-1998
WO 0108542	A	08-02-2001	US 6428799 B1 AU 768127 B2 AU 6394800 A BR 0012925 A CA 2378828 A1 CN 1377240 T CZ 20020332 A3 EP 1204361 A1 JP 2003505484 T WO 0108542 A1	06-08-2002 04-12-2003 19-02-2001 30-04-2002 08-02-2001 30-10-2002 17-07-2002 15-05-2002 12-02-2003 08-02-2001

**This Page is Inserted by IFW Indexing and Scanning  
Operations and is not part of the Official Record**

**BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

☒ **BLACK BORDERS**

☐ **IMAGE CUT OFF AT TOP, BOTTOM OR SIDES**

☐ **FADED TEXT OR DRAWING**

☐ **BLURRED OR ILLEGIBLE TEXT OR DRAWING**

☐ **SKEWED/SLANTED IMAGES**

☐ **COLOR OR BLACK AND WHITE PHOTOGRAPHS**

☐ **GRAY SCALE DOCUMENTS**

☐ **LINES OR MARKS ON ORIGINAL DOCUMENT**

☐ **REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY**

☐ **OTHER:** \_\_\_\_\_

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.**